

WHAT IS CLAIMED IS:

1. A multilumen catheter for directing the flow of blood through a patient through a single cannulation site, said catheter comprising:

a catheter having a proximal end, a first distal end, and a second distal end, said first distal end extending distally further from the proximal end than the second distal end;

a first lumen extending between said first distal end and said proximal end; and

a second lumen extending between said second distal end and said proximal end.

2. The multilumen catheter of Claim 1 further comprising at least one aperture in one of said lumens positioned near the proximal end so that the aperture may maintain or enhance perfusion of blood to the patient's vasculature downstream of where the aperture resides in said vasculature when said catheter is inserted into the patient for treatment.

3. The multilumen catheter of Claim 1 further comprising a Y-connector positioned at the proximal end, wherein a first leg of the Y-connector is in fluid communication with said first lumen and a second leg of the Y-connector is in fluid communication with said second lumen.

4. The multilumen catheter of Claim 1 further comprising an outflow conduit fluidly engaged to one lumen and an inflow conduit fluidly engaged to the other lumen, said inflow and outflow conduits fluidly coupled to a pump so that when connected to a patient, said pump circulates blood from one distal end of said multilumen catheter to the other distal end and also through the at least one aperture.

5. The multilumen catheter of Claim 1 wherein the first distal end is tapered.

6. The multilumen catheter of Claim 1 wherein the second distal end is tapered.

7. The multilumen catheter of Claim 4 wherein one of said distal ends comprises at least one distal aperture.

8. The multilumen catheter of Claim 1 wherein one of said distal ends comprises at least one distal aperture.

9. The multilumen catheter of Claim 1 wherein said first distal end comprises a J-tip comprising a bend.

10. The multilumen catheter of Claim 9 wherein said J-tip comprises an aperture positioned at the distal-most portion of the bend.

5 11. The multilumen catheter of Claim 1 further comprising a radiopaque marker, wherein the radiopaque marker can be used to position the catheter when the catheter is applied to a patient.

10 12. The multilumen catheter of Claim 1 further comprising an indicator near the proximal end, wherein the indicator can be used to position the catheter when the catheter is applied to a patient.

13. The multilumen catheter of Claim 4 further comprising a third lumen having a distal and a proximal end configured to be positioned entirely within the patient's vascular system.

15 14. The multilumen catheter of Claim 1 further comprising a third lumen having a distal and a proximal end configured to be positioned entirely within the patient's vascular system.

15. The multilumen catheter of Claim 14 wherein the distal end of the third lumen is tapered.

20 16. The multilumen catheter of Claim 15 wherein the proximal end of the third lumen is tapered.

25 17. A multilumen catheter for directing the flow of blood through a patient through a single cannulation site, said catheter comprising a catheter having at least three lumens, a first lumen for directing blood between a first blood vessel and a device, a second lumen for directing blood between a second blood vessel and said device, and a third lumen having a distal and proximal end configured to be positioned entirely within the patient's vascular system.

18. The multilumen catheter of Claim 17 further comprising a J-tip located at a distal end, wherein said first lumen extends between a proximal end and said distal end.

30 19. The multilumen catheter of Claim 18 wherein said J-tip comprises a bend and an aperture positioned at the distal-most portion of the bend.

20. The multilumen catheter of Claim 17 wherein the distal end of the third lumen is tapered.

21. The multilumen catheter of Claim 20 wherein the proximal end of the third lumen is tapered.

5 22. The multilumen catheter of Claim 17 further comprising an outflow conduit fluidly engaged to one lumen and an inflow conduit fluidly engaged to the other lumen, said inflow and outflow conduits fluidly coupled to a pump so that when connected to a patient, said pump circulates blood from one distal end of said multilumen catheter to the other distal end.

10 23. The multilumen catheter of Claim 17 further comprising a radiopaque marker, wherein the radiopaque marker can be used to position the catheter when the catheter is applied to a patient.

15 24. The multilumen catheter of Claim 17 further comprising an indicator near the proximal end, wherein the indicator can be used to position the catheter when the catheter is applied to a patient.

25. The multilumen catheter of Claim 17 wherein at least one of said lumens comprises at least one aperture positioned near the proximal end to maintain or enhance perfusion of blood to the patient's vasculature downstream of where the aperture resides in said vasculature when said catheter is inserted into the patient for treatment.

20 26. The multilumen catheter of Claim 17 further comprising an outflow conduit fluidly engaged to one lumen and an inflow conduit fluidly engaged to the other lumen, said inflow and outflow conduits fluidly coupled to a pump so that when connected to a patient, said pump circulates blood from one distal end of said multilumen catheter to the other distal end and also through the at least one aperture.

25 *Dr. H. B. 2* 27. An extracardiac pumping system for supplementing blood circulation in a patient without any component thereof being connected to the patient's heart, the extracardiac system comprising:

30 a pump configured to pump blood through the patient at subcardiac flow rates, said pump having an average flow rate that, during normal operation thereof, is substantially below that of the patient's heart when healthy;

an inflow conduit fluidly coupled to the pump to direct blood to the pump from a first blood vessel;

an outflow conduit fluidly coupled to the pump to direct blood from the pump to a second blood vessel; and

5 a multilumen catheter for directing the flow of blood through a patient through a single cannulation site, said catheter comprising

a catheter having a proximal end, a first distal end, and a second distal end, said first distal end extending distally further from the proximal end than the second distal end;

10 a first lumen extending between said first distal end and said proximal end, said first lumen in fluid communication with one of said conduits; and

a second lumen extending between said second distal end and said proximal end, said second lumen in fluid communication with one
15 of said conduits.

28. The extracardiac pumping system of Claim 27 further comprising at least one aperture in one of said lumens positioned near the proximal end so that the aperture may enhance perfusion of blood to the patient's vasculature downstream of where the aperture resides in said vasculature when said catheter is inserted into the patient for
20 treatment.

29. The extracardiac pumping system of Claim 27 wherein said first lumen is in fluid communication with said outflow conduit and said second lumen is in fluid communication with said inflow conduit.

30. The extracardiac pumping system of Claim 27 wherein said first lumen is in
25 fluid communication with said inflow conduit and said second lumen is in fluid communication with said outflow conduit.

31. An extracardiac pumping system for supplementing blood circulation in a patient without any component thereof being connected to the patient's heart, the extracardiac system comprising:

a pump configured to pump blood through the patient at subcardiac flow rates, said pump having an average flow rate that, during normal operation thereof, is substantially below that of the patient's heart when healthy;

5 an inflow conduit fluidly coupled to the pump to direct blood to the pump to a first blood vessel;

an outflow conduit fluidly coupled to the pump to direct blood from the pump to a second blood vessel; and

10 a multilumen catheter for directing the flow of blood through a patient through a single cannulation site, said catheter comprising at least three lumens, a first lumen for directing blood between a first blood vessel and a device, said first lumen in fluid communication with one of said conduits, and a second lumen for directing blood between a second blood vessel and said device, said second lumen in fluid communication with one of said conduits, and a third lumen having a distal and proximal end configured to be positioned entirely within the patient's vascular system, said catheter adapted for insertion into said patient at a single cannulation site.

15 32. The extracardiac pumping system of Claim 31 wherein said first lumen is in fluid communication with said outflow conduit and said second lumen is in fluid communication with said inflow conduit.

20 33. The extracardiac pumping system of Claim 31 wherein said first lumen is in fluid communication with said inflow conduit and said second lumen is in fluid communication with said outflow conduit.

25 34. The extracardiac pumping system of Claim 31 wherein at least one of said lumens comprises at least one aperture positioned near the proximal end so that the aperture may maintain or enhance perfusion of blood to the patient's vasculature downstream of where the aperture resides in said vasculature when said catheter is inserted into the patient for treatment.

30 35. A method of treating a patient using a multilumen catheter the method comprising the steps of:

inserting a multilumen catheter into the patient through a single cannulation site into a first blood vessel,

the multilumen catheter comprising a catheter having a proximal end, a first distal end, a second distal end, said first distal end extending distally further from the proximal end than the second distal end, a first lumen extending between said first distal end and said proximal end, a second lumen extending between said second distal end and said proximal end,

at least one aperture in one of said lumens positioned near the proximal end so that the aperture may maintain or enhance perfusion of blood to the patient's vasculature downstream of where the aperture resides in said vasculature when said catheter is inserted into the patient for treatment,

wherein said first lumen may be in fluid communication with a second blood vessel and said second lumen may be in fluid communication with said first blood vessel,

withdrawing blood from one of said blood vessels through one of said first or said second lumens, and

delivering blood through the other of said first or second lumens.

36. The method of Claim 35 comprising the steps of withdrawing blood from said second vessel through said first lumen and delivering blood to said first vessel through said second lumen.

37. The method of Claim 35 comprising the steps of withdrawing blood from said first vessel through said second lumen and delivering blood to said second vessel through said first lumen.

38. A multilumen catheter for directing the flow of blood through a patient through a single cannulation site comprising:

a catheter having a proximal end, a first distal end, a second distal end, a first lumen extending between said first distal end and said proximal end, and a second lumen extending between said second distal end and said proximal end;

said first distal end extending further from the proximal end than the second distal end; and

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a means for maintaining or enhancing perfusion to the patient's vasculature downstream of a point of entry of said catheter into a blood vessel when said catheter is inserted into the patient for treatment.

5 39. The multilumen catheter of Claim 38 wherein the means for maintaining or enhancing perfusion comprises an active perfusion means.

40. The multilumen catheter of Claim 38 wherein the means for maintaining or enhancing perfusion comprises a passive perfusion means.

41. The multilumen catheter of Claim 38 wherein the active perfusion means comprises an aperture.

10 42. The multilumen catheter of Claim 38 wherein the passive perfusion means is a third lumen having a distal and a proximal end configured to be positioned entirely within the patient's vascular system.

15 43. The multilumen catheter of Claim 38 wherein the active perfusion means is at least one aperture in one of said lumens positioned near the proximal end so that the aperture may enhance perfusion of blood to the patient's vasculature downstream of where the aperture resides in said vasculature when said catheter is inserted into the patient for treatment.

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